

The Relationship Between Eating Patterns and the Occurrence of Metabolic Syndrome in the Elderly at the Haijah Hasmah Noor Foundation Nursing Home, North Jakarta

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Abstract

Metabolic syndrome is a critical health concern among the elderly, encompassing central obesity, hypertension, hyperglycemia, and dyslipidemia, all of which are increasingly prevalent in nursing home settings. This study aimed to examine the relationship between eating patterns and the occurrence of metabolic syndrome among elderly residents at the Haijah Hasmah Noor Foundation Nursing Home, North Jakarta, as well as to review these findings from an Islamic health perspective. A quantitative cross-sectional design was employed involving 35 elderly respondents. Data on dietary intake were collected using the Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ) and 24-Hour Food Recall, while metabolic syndrome was assessed through standardized measurements of waist circumference, blood pressure, fasting blood glucose, and lipid profile. Statistical analysis was conducted using the Chi-Square test with a 95% confidence level. The results revealed that 54.3% of respondents were diagnosed with metabolic syndrome. Dietary assessment showed that 60% of respondents had excessive energy intake based on Nutritional Adequacy Rate (AKG) standards. A statistically significant relationship was found between eating patterns and metabolic syndrome ($p = 0.013$; OR = 6.25), central obesity ($p = 0.017$; OR = 5.76), and hypertension ($p = 0.02$; OR = 5.667). However, no significant relationship was established between eating patterns and hyperglycemia ($p = 0.139$) or dyslipidemia ($p = 0.782$). From an Islamic perspective, these findings align with the principles of moderation (*wasatiyyah*), avoidance of excess (*isrāf*), and the consumption of halal and *thayyib* foods, reinforcing the spiritual foundation of preventive health in the elderly.

INTRODUCTION

Aging is a phase of life in which a tissue slowly loses its ability to repair, replace, or maintain its normal function. When an individual experiences aging, there are physiological changes such as changes at the structural, functional, and molecular levels causing them to become ineffective in daily life. As we age, a person will experience a decrease in organ function and be prone to developing degenerative diseases that can be chronic. Physiological changes in the body such as changes in the digestive system and also changes in the metabolic system can affect the absorption of nutrients in old age (Fitria & Farapti, 2023; Research et al., 2023; Siregar, 2023; Veranita et al., 2024).

One of the conditions or circumstances that can occur due to the aging process is metabolic syndrome (SM), which is a collection of metabolic disorders such as central obesity,

hypertension, hyperglycemia, and dyslipidemia (Fitria and Farapti, 2023) . Metabolic syndrome itself is a risk factor for non-communicable diseases with high rates of pain and death, such as stroke, cardiovascular disease, diabetes, and cancer (Nurzakiah *et al.* , 2021)

Criteria based on the *National Cholesterol Education Program*, which has been developed for the Asian population, state that SM can be diagnosed in a person if there are at least three of the following five signs: increased waist circumference (above 90 cm in men and above 80 cm in women), high blood triglyceride levels (more than 150 mg/dL), low HDL cholesterol (men < 45 mg/dL and women < 50 mg/dL), hypertension (more than 130/85 mmHg), and high fasting blood sugar levels (more than 110 mg/dL) (Fitria and Farapti, 2023).

According to epidemiological data from , the prevalence of metabolic syndrome globally has reached 20-25%. Globally, the prevalence of metabolic syndrome in the Asian population ranges from 12-37% with the prevalence in Indonesia reaching 21.66% in 2019, and 28% in men and 46% in women in 2020. RISKESDAS 2018 data shows that the prevalence of SM in Indonesia includes 33.43% in DKI Jakarta, 39.60% in West Java, 22.22% in Papua, 29.97% in Bali, 36.99% in West Kalimantan, 44.13% in South Kalimantan, 31.68% in North Sulawesi and 30.44% in South Sumatra. The prevalence of BC in urban areas is higher than in rural areas, which can be attributed to changes in people's lifestyles to become more modern. *International Diabetes Federation* (Ministry of Health of the Republic of Indonesia, 2018; Source: Stuttgart *et al.*, 2024).

There has been a shift in food consumption among urban people, namely from the consumption of traditional foods that are rich in nutrients and fiber to Western-flavored foods with little fiber. Recently, Indonesian people are increasingly fond of consuming ready-to-eat food. In fact, according to , bad eating habits can affect the type of food a person consumes. Consumption of fast food, which tends to be high in fat and calories, can increase a person's chances of experiencing various diseases, both progressive and sudden ones, including heart disease, obesity, blood cholesterol disorders, diabetes, diabetes, cancer, and stroke Mahatir (2023).

In the context of the elderly, nutritional fulfillment is needed to get a healthy body. Diet refers to a set of data that describes the type and amount of food consumed regularly by an individual or group, as well as the characteristics that distinguish a social group. Meanwhile, food consumption refers to the total amount of food available to eat (Lasimpala *et al.*, 2021; Nurzakiah *et al.*, 2021).

According to the Ministry of Health (2023), energy needs in healthy elderly people start from 25-30 kcal/kg/day. The nutritional needs of the elderly include: a) nutrient-dense food and drinks are the best; b) eat less sugar, salt, and saturated fat; c) eat foods rich in calcium and vitamin D to strengthen bones and teeth; d) get used to eating vegetables, fruits, and seeds, especially green, red, and orange ones; e) drink enough water; f) eat foods rich in B12, potassium, and iron. By following these recommendations, the elderly are expected to maintain optimal body health, which is indispensable to slow down the aging process and distance themselves from chronic diseases (Veranita) *et al.* , 2024).

The 3J principle in diet can help reduce the risk of degenerative diseases by ensuring the right number of calories, the correct timing of meals, and the selection of the type of food that suits the body's needs. This principle is very important to prevent the occurrence of degenerative diseases, such as metabolic syndrome, especially in the elderly. A healthy diet is balanced nutrition with a composition of 25-30% fat, 50-55% carbohydrates, and 20% protein. If these three principles are applied properly, the risk of diseases such as obesity, diabetes, hypertension, and dyslipidemia, can be minimized, so that the quality of life of the elderly can be better maintained (Safitri, Sayyida and Tyagita, 2024) .

From an Islamic perspective, health is a blessing as well as a mandate from Allah SWT that must be maintained by every individual, including the elderly. The human body is seen as

the main means of worship, so any form of behavior that is detrimental to health, including an unbalanced and excessive diet, is contrary to Islamic values (Irfan *et al.*, 2023; Scott, S. S. and S. S. Scott, 2024). The Qur'an expressly prohibits excessive behavior (*isrāf*) in the consumption of food and drinks, as stated by Allah SWT in the Qur'an. Al-A'raf [7]:31 which commands people to eat and drink without exceeding the limits. This principle shows that controlling the amount, type, and habits of eating is part of the moral and spiritual responsibility of a Muslim (Kurniasari, Wijaya and Rahman, 2023).

As we age, Islam also recognizes that humans will experience a decrease in physical strength and an increase in susceptibility to disease, as explained in QS. Ar-Rum [30]:54. Therefore, a good diet arrangement is becoming increasingly important in the elderly group as a form of effort to maintain health and quality of life. The concept of *halalan thayyiban* (Gusmita, Rukaiyah and Walad, 2024) *halalan thayyiban* in Islam emphasizes that food must not only be legally halal, but also good, safe, and beneficial for the health of the body. This principle is in line with modern health approaches that emphasize a balanced, high-fiber, and low-saturated fat diet as an effort to prevent metabolic diseases (Kurniawan, 2024; Veranita *et al.*, 2024).

Thus, the problem of metabolic syndrome in the elderly can not only be understood as a medical problem, but also as a behavioral problem related to adherence to Islamic values in managing diet. The study of the relationship between diet and the incidence of metabolic syndrome in the elderly in the Islamic review is important, as it is able to provide a holistic perspective that integrates aspects of physical and spiritual health. This approach is expected to strengthen promotive and preventive efforts in maintaining the health of the elderly, especially in nursing homes that have a centralized food supply system (Aufa, Firdaus and Fadilurrahman, 2024)

Seeing this context, the researcher is interested in researching the Hajjah Hasmah Noor Foundation Nursing Home in North Jakarta as a research location, because based on initial surveys and interviews with administrators and several elderly, it was found that a tendency to eat a diet dominated by the consumption of high amounts of carbohydrates and fats. This habit can be seen from the many elderly people who complain of health problems related to metabolism, such as unstable blood pressure, excess weight, and sugar and cholesterol that tend to increase. The field findings show strong indications that the diet in the orphanage is not balanced and potentially related to the high number of health problems that are included in the metabolic syndrome component.

Although metabolic syndrome is one of the main health problems in the elderly, research on the relationship between diet and the incidence of metabolic syndrome in nursing homes, especially in North Jakarta, is still very limited. Elderly people in nursing homes often face gaps in diet, including poor quality of intake and an imbalance in the composition of nutrients consumed. Similar studies have focused more on the general population or the elderly in the community, so they have not provided a specific picture of diet in nursing homes and their association with metabolic syndrome. This study aims to fill the gap, provide specific data related to diet in nursing homes, and find out what components have the most influence on the incidence of metabolic syndrome in nursing homes. Therefore, researchers are interested in researching the relationship between diet and the incidence of metabolic syndrome in the elderly in nursing homes.

In accordance with the background of the problems already described, one of the most common health problems experienced by the elderly is metabolic syndrome, which can be affected by diet. An unbalanced diet can increase the risk of metabolic syndromes, such as central obesity, hypertension, hyperglycemia, and dyslipidemia. Further research is needed to understand the relationship between diet and metabolic syndrome in the elderly at the Hajjah Hasmah Noor Foundation Nursing Home. The relationship between the two is crucial to

provide proper dietary advice to reduce the risk of metabolic syndrome in seniors living in nursing homes.

The research questions of this study are formulated to explore several key aspects related to metabolic syndrome among the elderly at the Hajjah Hasmah Noor Foundation Nursing Home. This study seeks to identify the prevalence of metabolic syndrome in the elderly population within the nursing home and to examine whether there is a relationship between dietary patterns and the incidence of metabolic syndrome among them. Furthermore, it aims to analyze how unhealthy dietary habits influence the components of metabolic syndrome, including central obesity, hypertension, hyperglycemia, and dyslipidemia. In addition, this research also investigates how the principles of diet in Islam are related to the prevention of metabolic syndrome in the elderly.

The general objective of this study is to determine the relationship between diet and the incidence of metabolic syndrome among elderly individuals residing at the Hajjah Hasmah Noor Foundation Nursing Home, while also reviewing the findings from both a health perspective and Islamic values. More specifically, this study aims to determine the prevalence of metabolic syndrome among the elderly in the nursing home, to analyze the relationship between dietary intake and the occurrence of metabolic syndrome, and to assess the impact of unhealthy dietary patterns on central obesity, hypertension, hyperglycemia, and dyslipidemia. Additionally, this study seeks to examine the alignment between Islamic dietary principles and efforts to prevent metabolic syndrome in the elderly population.

METHODS

Types of Research

This study uses a quantitative design with a *cross-sectional study* approach, in which independent variables (diet) and dependent variables (occurrence of metabolic syndrome) are collected simultaneously in a given time period. This method aims to measure the relationship between diet and the incidence of metabolic syndrome in the elderly at the Hajjah Hasmah Noor Foundation Nursing Home. The research was carried out from April 25 to July 25.

The research activities included the collection of primary data through the distribution of questionnaires that included diet and direct measurement of indicators of metabolic syndrome, namely blood pressure, waist circumference, blood sugar levels, and lipid profiles. In addition, secondary data is also used, including information from the medical records of the elderly and documentation of the orphanage related to the meal schedule and the menu provided.

Data Collection Instruments

In this study, the instruments used to collect data include:

Diet

Dietary intake data collection is carried out through the following steps:

- a. Recording of the type, frequency, and amount of food was collected using *the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ)* and *24-Hour Food Recall*. The SQ-FFQ questionnaire is used to record the frequency of food consumption, while *the 24-Hour Food Recall* records the food consumed in the last 24 hours.
- b. The results from the SQ-FFQ and 24-Hour Food Recall will be converted into Ingredient Changer (BMP) to calculate the total calories consumed.
- c. The recorded calorie intake will be analyzed based on the Nutritional Adequacy Score (AKG) to assess whether the nutritional intake consumed by the elderly is in accordance with existing recommendations.

Metabolic Syndrome

Measurement of metabolic syndrome is carried out using diagnostic criteria based on international standards, such as NCEP ATP III (National *Cholesterol Education Program Adult*

Treatment Panel III) or IDF (International Diabetes Federation). The measurements carried out include:

- Waist circumference data was measured using a tape measure as per standard procedures to determine central obesity.
- Blood pressure data was measured using a digital sphygmomanometer to obtain systolic and diastolic pressure values.
- Fasting blood sugar level data was checked using enzyme-based spectrophotometry methods after respondents fasted for 8–10 hours.
- The lipid profile data was examined using the enzymatic spectrophotometry **method**, with a blood sample that had been processed through centrifugation, then measured for absorbance using a colorimeter.

Data Analysis

Validity Test and Reliability Test

Validity Test

The validity test is used to evaluate the feasibility of each item in the questionnaire in defining the variables being measured. This test determines the extent to which a measurement instrument is able to measure what should be measured. The higher the level of validity of a measuring instrument, the more precise it will be in achieving its goals and measuring the aspect in question. To determine the correlation value, *the Pearson Product Moment* (Unaradjan and Sihotang, 2019) technique is used.

$$r = \frac{N(\sum XY) - (\sum X \sum Y)}{\sqrt{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}}$$

Description:

r = Validity coefficient of the question item searched

N = Number of sample members

X = Total respondent score

Y = The total score of each respondent's statement

$\sum X$ = Number of scores in the distribution X

$\sum Y$ = Number of scores in the distribution Y

$\sum X^2$ = The sum of squares of each X

$\sum Y^2$ = The sum of squares respectively

The questionnaire is considered valid if the Product Moment correlation coefficient (r) is more than 0.361 or if the value of the calculation correlation coefficient (r-calculus) exceeds the value of the correlation coefficient of the table (r-table). Therefore, a correlation test using *the Pearson Product Moment method* was conducted to assess the validity of each item on the questionnaire.

Reliability Test

Reliability is an indicator that describes the level of confidence or consistency of a measuring tool or instrument. To test the reliability of the instrument, *Cronbach's Alpha formula* was used, namely:

$$r_i = \left[\frac{k}{k-1} \right] \left[1 - \frac{\sum S_i^2}{S_i^2} \right]$$

Description:

r_i = Instrument reliability

k = The number of questions or the number of questions

$\sum S_i^2$ = Number of item variants

S_i^2 = Total variance

A questionnaire is considered reliable if the results of the instrument test show a value of Cronbach's Alpha $> r_{\text{criterion}}$ (0.60).

Univariate Analysis

Univariate analysis was carried out to describe each variable used in the study in a statistically descriptive manner. This analysis aims to provide an overview of the data distribution of each variable. The variables analyzed univariately in this study consisted of:

- a. Diet, which was measured using the SQ-FFQ (*Semi Quantitative Food Frequency Questionnaire*) questionnaire, was then categorized based on the level of adequacy or consumption patterns of the respondents.
- b. The incidence of metabolic syndrome, which is classified into two categories, namely "experiencing metabolic syndrome" and "not experiencing metabolic syndrome" based on the results of measuring the components of metabolic syndrome according to the set criteria.

The results of univariate analysis will be presented in the form of frequency and percentage distribution for each category of the variable.

Bivariate Analysis

Bivariate analysis is performed to test the relationship between two variables that are suspected to be interrelated or have a correlation, with the aim of assessing the extent to which the relationship is significant.

In this study, bivariate analysis was used to evaluate the association between diet and the incidence of metabolic syndrome, as well as the relationship of other risk factors, such as frequency, interlude, portion, and the incidence of metabolic syndrome. One of the methods used in bivariate analysis is the Chi-Square test.

Chi Square

The Chi-Square test is used to analyze the relationship between two categorical variables. The results of this test can determine whether there is a difference in proportion between the groups studied or, in other words, whether there is a relationship between the two variables. To measure the level of relationship, the Odds Ratio (OR) measure is used, which compares the odds in the exposed group with the odds in the unexposed group. The Chi-Square test aims to test the significance of the relationship between the variables studied with a 95% confidence level. The assessment is carried out by referring to the p-value, which has the following conditions: if the p-value ≤ 0.05 , then the relationship between variables is considered significant; Meanwhile, if the P-value > 0.05 , then the relationship between variables is considered insignificant.

RESULTS AND DISCUSSION

Univariate Analysis

The analysis in this section begins with a univariate descriptive analysis. This stage is an important process in data exploration that aims to describe and summarize the value characteristics of the variables being studied. Using descriptive statistics, univariate analysis provides information about the distribution of data. The results of this analysis will form the basis for a more in-depth interpretation of bivariate analysis in the next section.

Overview of Diet and Measuring Instruments

Based on the results of the study, the distribution of dietary frequency in the elderly at the Hajjah Hasmah Noor Foundation Nursing Home in North Jakarta based on the category of energy intake compared to the Nutritional Adequacy Rate (AKG) in the elderly is the Hajjah Hasmah Noor Foundation Nursing Home.

Most respondents (60%) had energy intake that exceeded their needs based on the AKG, while 40% had energy intake that was classified as adequate results, and no respondents were found with deficit energy intake ($<80\%$ AKG). These results are cumulative from the

measurement of three instruments, namely the number of main and intermittent meal frequencies, as well as the number of meal portions in nursing home seniors which can be determined based on the following table.

- a. Only 2 (5.7%) of the 35 respondents ate with a Less/Low frequency, which could mean missing the main meal time.
- b. Almost half of the respondents, namely 17 people (48.6%) ate 3 meals a day in a regular (moderate/normal) pattern.
- c. The other 16 people (45.7%) ate more than 3 times a day (much/excessively), which was indicated to include late dinners or additional meals outside normal hours.

Table 1. Distribution of Frequency of Elderly Interlude Meals at the Hajjah Hasmah Noor Foundation Nursing Home, North Jakarta

Meal Interruptions	Frequency	Percentage
Little/Low \leq 1 Time	7	20%
Enough/ Normal 2 – 3 times	14	40%
Too Much/Too > 3 Times	14	40%
Total	35	100%

Based on the table data regarding the frequency of intermittent meals, it is known that:

- a. 7 people (20%) of the elderly respondents rarely consumed snacks (slightly in the range of 0 – 1 times) between main meals.
- b. 14 elderly respondents (40%) had a snack pattern that was considered reasonable or sufficient at 2-3 times between main meals.
- c. As much as the frequency of interludes is sufficient, 14 elderly respondents over-indulged snacks at an intensity of three times or more between main meals, which can contribute extra calories.

Table 2 Distribution of Food Portions for the Elderly at the Hajjah Hasmah Noor Foundation Nursing Home, North Jakarta

Meal Portions	Frequency	Percentage
Little/ Low	7	20,0
Enough/ Normal	12	34,3
Much/Excess	16	45,7
Total	35	100,0

Based on the data in the table above, it is known that:

- a. 7 Elderly people or 20% of the elderly respondent data consume food in small/little/less portions.
- b. 12 elderly respondents or 34.3% of the total respondents consumed food in sufficient/balanced portions.
- c. 16 respondents or almost half of the respondents (45.7%) ate large portions, which indicates a potential calorie surplus.

Overview of the incidence of metabolic syndrome

Based on the results of the study, the distribution of the frequency of occurrence of metabolic syndrome in the elderly at the Hajjah Hasmah Noor Foundation Nursing Home, North Jakarta was obtained.

Based on the data, it is known that more than half of the respondents or as many as 19 people (54.3%) experienced metabolic syndrome, showing a fairly high prevalence among the elderly in this orphanage, while the remaining 45.7% or as many as 16 elderly respondents did not show/experienced symptoms of metabolic syndrome. These results are a cumulative

description of the indicators measuring metabolic syndrome such as the many occurrences of central obesity, hypertension, hyperglycemia, and dyslipidemia, as can be seen in the description based on the table below.

Table 3 Distribution of Central Obesity Frequency in the Elderly at the Hajjah Hasmah Noor Foundation Nursing Home, North Jakarta

Central Obesity	Frequency	Percentage
No	14	40%
Yes	21	60%
Total	35	100%

Based on the table above, it is concluded descriptively that:

- 60% of respondents or 21 people were centrally obese, meaning fat buildup in the abdominal area, a major risk of metabolic syndrome and heart disease.
- 40% of respondents or 14 people did not experience Central Obesity conditions.

Table 4 Distribution of Frequency of Hypertension Incidence in the Elderly at the Hajjah Hasmah Noor Foundation Nursing Home, North Jakarta

Hypertension	Frequency	Percentage
No	12	34,3%
Yes	23	65,7%
Total	35	100%

Based on the table above, it is concluded descriptively that:

- 65.7% of respondents or as many as 23 people indicated hypertension, a fairly high number and can be influenced by sodium intake, weight, and stress.
- 34.3% of respondents or as many as 12 people were free of hypertension.

Table 5 Distribution of Frequency of Hyperglycemia Incidence in the Elderly at the Hajjah Hasmah Noor Foundation Nursing Home, North Jakarta

Hyperglycemia	Frequency	Percentage
No	32	91,4%
Yes	3	8,6%
Total	35	100%

Referring to the table above, it is known that:

- 8.6% of respondents or as many as 3 people had high blood sugar levels, which could lead to prediabetes or diabetes.
- 91.4% of respondents or as many as 32 normal people.

Table 6 Distribution of the Frequency of Dyslipidemia Incidence in the Elderly at the Hajjah Hasmah Noor Foundation Nursing Home, North Jakarta

Dyslipidemia.	Frequency	Percentage
No	16	45,7%
Yes	19	54,3%
Total	35	100%

Referring to the table above, it is known that:

- 54.3% of the respondents or as many as 19 people had an imbalance of blood fats (cholesterol & triglycerides).
- 45.7% of respondents or as many as 16 people did not experience dyslipidemia.

Validity and Reliability Tests

Validity Test of Dietary Variables and Metabolic Syndrome

Validity tests are used to ensure that the instrument or indicator used is able to accurately measure research variables. An item is declared valid if the calculated *r value* is greater than *the table r* (0.361). The following are the results of the validity test carried out.

The *r*.calculated value, on all dietary instruments consisting of the frequency of meals in a day, intermittent foods and portions of food consumed showed an *r*.calculated value greater than 0.361. Thus, the instruments of eating frequency, interlude, and food portions were declared valid to measure dietary variables.

The data shows that the *r*.calculated value, in all instruments of Metabolic Syndrome consisting of Central Obesity, Hypertension, Hyperglycemia, Dyslipidemia, shows an *r*.calculated value greater than 0.361. Thus, the instruments of central obesity, hypertension, hyperglycemia, and dyslipidemia were declared valid.

Reliability Test of Dietary Variables and Metabolic Syndrome

The reliability test of this sub-chapter aims to measure whether the variables used, including the instruments/indicators in them, are consistently able to measure the variables correctly or vice versa. The parameter used to measure the consistency or reliability of the measuring instrument is to measure the cumulative Cronbach's Alpha value, which if the value is greater than and or equal to zero to the point six, then the data is considered reliable (reliable if Cr. Alpha ≥ 0.6).

Based on the results of the reliability test, it is known that the Cronbach's Alpha value on the diet variable consisting of the instrument of the frequency of meals in a day, intermittent meals and food portions shows a Cronbach's Alpha value of 0.732, greater than the required Cronbach's Alpha value of 0.60. Therefore, based on this, it is concluded that the diet variable passed the reliability test.

Based on the results of the reliability test, it is known that the Cronbach's Alpha value in the Metabolic Syndrome variable consisting of Central Obesity, Hypertension, Hyperglycemia, and Dyslipidemia, instruments shows a Cronbach's Alpha value of 0.666, greater than the required Cronbach's Alpha value of 0.60. Therefore, based on this, it is concluded that the Metabolic Syndrome variable passed the validity test.

Bivariate Test of Variables and Diet Instruments with Metabolic Syndrome

Bivariate testing aims to test the association/relationship hypothesis built from a theoretical approach stated in a study. If the test criteria show a significant value, which in this study uses a chi-square value, then this will strengthen or support the theory, on the other hand, if the value does not show significant then it is contrary to the theory. The bivariate testing of this study will discuss the simultaneous relationship between dietary behavior and metabolic syndrome in the elderly in the Werdha orphanage, then will discuss the relationship between unhealthy diet and metabolic syndrome factors such as central obesity, hypertension, hyperglycemia, and dyslipidemia, as can be seen from the following table. In this study, the Chi-Square test was used with a confidence level of 95% ($\alpha = 0.05$).

Based on the Pearson chi square test, it is known that the Chi Square value is $6,217 > \text{Chi Square table } 3,841$ (df 1; alpha 5%); and or Asymp values. Sig. (2-sided) $0.013 < 0.05$ (5% research error rate). So it can be implied that H_0 is rejected, and H_1 is accepted, which means that there is a relationship between diet and the occurrence of metabolic syndrome.

Based on the data results, it is known that the elderly with excess nutritional intake (excessive CK) have a 6.25 times greater chance of experiencing metabolic syndrome compared to the elderly with adequate or low nutritional intake. In contrast, the group with adequate–low AKG had a lower risk of up to 60% ($1 - 0.4$) of developing metabolic syndrome.

It is known that of the 14 respondents with adequate nutritional intake, as many as 4 people (11.4%) experienced metabolic syndrome, while 10 people (28.6%) did not experience

metabolic syndrome. Meanwhile, of the 21 respondents with excess nutritional intake, there were 15 people (71.4%) who had metabolic syndrome and 6 people (17.1%) who did not have metabolic syndrome. This shows that the proportion of metabolic syndrome incidence is higher in the group with excess nutritional intake than in the group with adequate nutritional intake, so it can be concluded that overeating tends to be associated with an increased risk of metabolic syndrome.

Bivariate Test of Dietary Variables with Central Obesity Instrument

Based on the Pearson Chi Square test, it is known that the Chi Square value is $5.734 >$ Chi square table 3.841 (df 1; alpha 5%); and the Asymp. Sig. (2-sided) value is $0.017 < 0.05$ (5% research error rate). This shows that there is a meaningful relationship between diet and central obesity in the elderly in nursing homes.

The results of the analysis showed that the elderly with excess nutritional intake had a 5.76 times greater chance of experiencing central obesity compared to the elderly who had adequate or low nutritional intake. In addition, the elderly with adequate–low AKG had a 53.1% lower risk of developing central obesity compared to those with excess nutritional intake ($1 - 0.469 = 0.531$).

Most of the elderly with excess nutritional intake were centrally obese (45.7%), while only 14.3% of this group were not centrally obese. Meanwhile, in the group with adequate and low nutritional intake, the proportion of the elderly who did not experience central obesity was higher (25.7%) than those who experienced central obesity (14.3%). These findings suggest that nutritional overintake tends to be associated with an increased incidence of central obesity in the elderly.

Bivariate Test of Dietary Variables with Hypertension Instruments

Based on testing *Pearson Chi Square* It is known that the value of the chi square is $5.411 >$ the Chi square of the table is 3.841 (df 1; alpha 5%); and Asymp values. Sig. (2-sided) $0.02 < 0.05$ (5% research error rate) indicates that the results of this test are statistically significant. Thus, it can be concluded that that H0 is rejected, and H1 is accepted, which means that there is a relationship between diet and hypertension.

Table 7 Risk Estimate Test of the Relationship between Diet and Hypothetical Instruments in Nursing Home Elderly.

	Risk Estimate Hypertension		
	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for AKG (Adequate / Overrated)	5.667	1.241	25.878
For cohort Hypertension = No	3.000	1.113	8.086
For cohort Hypertension = Yes	.529	.279	1.003
N of Valid Cases	35		

Based on the results of the data, it is known that:

- a. Elderly people with an excess CRA have a 5.667 times greater chance of experiencing hypertension compared to people with an adequate and or low CRA.
- b. Elderly people with moderate-low CKD have a lower risk of developing hypertension up to 52.9%, because the risk of developing hypertension is 47.1% of the number of people with an excess CK.

Most of the elderly with excess nutritional intake have hypertension (48.6%), while only 11.4% of this group do not have hypertension. Meanwhile, in the group with adequate-low nutritional intake, the proportion of the elderly who did not have hypertension (22.9%) was greater than those who had hypertension (17.1%). These findings suggest that excessive nutritional intake is associated with an increased incidence of hypertension in the elderly.

Bivariate Test of Dietary Variables with Hyperglycemia Instrument

Based on the Pearson Chi Square test, it was found that the chi square value was $2.188 <$ Chi square table 3.841 (df 1; alpha 5%); and or the Asymp. Sig. (2-sided) value of $0.139 > 0.05$ (research error rate 5%). Therefore, it is stated that H0 is accepted, and H1 is rejected, which means that there is no relationship between diet and hyperglycemia. Because there is no relationship between the two factors, the risk estimate analysis test cannot be carried out.

All respondents with adequate nutritional intake (14 people; 40.0% of the total sample) did not experience hyperglycemia. In contrast, in the group with excess nutritional intake (21 people; 60.0% of the total sample), as many as 18 people (51.4%) did not experience hyperglycemia, while 3 people (8.6%) experienced hyperglycemia.

All cases of hyperglycemia (3 people) were only found in the group with excess nutritional intake, so descriptively it appears that hyperglycemia is more experienced by individuals with nutritional intake that exceeds daily needs.

However, based on the results of the Chi-square statistical test ($p = 0.139 > 0.05$), this difference is not statistically significant, so the relationship between diet and the incidence of hyperglycemia cannot be concluded to be significant.

Bivariate Test of Dietary Variables with Dyslipidemia Instrument.

Based on the Pearson chi square test, it was found that the chi square value was $0.077 <$ Chi square table 3.841 (df 1; alpha 5%); and or the Asymp. Sig. (2-sided) value of $0.782 > 0.05$ (5% research error rate), so H0 was accepted and H1 was rejected. Thus, it can be concluded that there is no significant relationship between diet and the incidence of dyslipidemia in the elderly at the Hajjah Hasmah Noor Foundation Nursing Home, North Jakarta. Because there is no meaningful relationship, the risk estimation test (*Odds Ratio/Risk Estimate*) cannot be performed.

Table 8 Description of the Crosstab Relationship between Diet and Dyslipidemia Instruments in the Elderly in Nursing Home.

		Diet * Crosstab Dyslipidemia			
		Dyslipidemia.		Total	
		No	Yes		
AKG	Adekuat	Count	6	8	14
		% of Total	17.1%	22.9%	40.0%
	Excess	Count	10	11	21
		% of Total	28.6%	31.4%	60.0%
Total		Count	16	19	35
		% of Total	45.7%	54.3%	100.0%

Based on Table 4.26 of the 14 respondents with adequate nutritional intake, as many as 6 people (17.1%) did not suffer from dyslipidemia, and 8 people (22.9%) suffered from dyslipidemia. The proportion of elderly people with dyslipidemia in this group was 57.1% (8 out of 14).

Meanwhile, of the 21 respondents with excess nutritional intake, there were 10 people (28.6%) without dyslipidemia and 11 people (31.4%) with dyslipidemia. The proportion of dyslipidemia sufferers in this group was 52.4% (11 out of 21).

Descriptively, the prevalence of dyslipidemia was slightly higher in the group with adequate nutritional intake compared to the group with excess nutritional intake. However,

based on the Chi-Square statistical test ($p = 0.782 > 0.05$), this difference was not statistically significant.

Based on the results of the study, most of the elderly have a diet that tends to be adequate to excessive based on the value of the Nutritional Adequacy Score (AKG). The frequency of the main meals of the respondents was generally in the normal category, namely three times a day, with a total of 17 respondents. Some studies suggest that eating frequency is associated with risk factors for metabolic syndrome, such as obesity, lipid profile, and blood glucose levels. Research conducted by reported that consumption of foods with higher frequencies was associated with a better metabolic profile. However, in this study, although most elderly people have a normal eating frequency, the incidence of metabolic syndrome remains high, which indicates that other factors such as food portions and total energy intake have a more dominant role than the frequency of eating alone. A study in the Korean population reported that the consumption of two meals per day, particularly by skipping breakfast, was associated with an increased odds of metabolic syndrome and its metabolic component. Proposed mechanisms include increased energy intake per meal time that triggers postprandial glucose spikes, insulin resistance, oxidative stress, and chronic inflammation. However, in this study, most of the elderly had a normal primary meal frequency, so the frequency of eating alone did not adequately explain the high incidence of metabolic syndrome. This suggests that food portions and total energy intake may have a greater role than the frequency of meals (Alkhulaifi & Darkoh, 2022; Park et al., 2023).

The hypothesis results show that in general, the elderly with excessive eating behavior have a six times higher probability of experiencing metabolic syndrome when compared to the elderly who have a normal/adequate diet. This is consistent with the support of research theories that state that poor and excessive diet, as well as low in fiber and micronutrients can lead to an increase in various factors that cause metabolic syndrome such as increased fat, sugar, and sodium which are harmful to the health of the elderly, so it is important for the elderly to maintain a regular diet and balanced nutritional intake to avoid metabolic syndrome (Swarup et al. 2025).

In the elderly group, the aging process causes various physiological changes that affect the body's metabolic regulation. One of the main changes is a decrease in the basal metabolic rate, so that the same or excess energy intake can more easily lead to body fat accumulation and insulin resistance. In addition, aging is also accompanied by changes in body composition in the form of increased fat mass and decreased muscle mass (*sarcopenic obesity*), which contributes to impaired glucose and lipid metabolism. Hormonal changes due to aging, such as decreased growth hormone, IGF-1, estrogen, and testosterone, also reduce insulin sensitivity and increase the risk of metabolic syndrome. Therefore, although the eating frequency of the elderly appears normal, excessive eating patterns can still have a greater metabolic impact than younger age groups (Zhang *et al.* , 2023).

The causative factors for metabolic syndrome based on this study are also caused by the occurrence of central obesity, which based on the results is known that excessive diet has a significant relationship with the incidence of central obesity in the elderly, where individuals with unhealthy diets and tend to overeat have a potential of five times higher when compared to individuals who have a normal diet. states that visceral obesity is triggered by a combination of unhealthy lifestyles, including the consumption of high-energy, low-nutrient, and irregular foods. A diet high in fat and sugar causes excess calories stored as fat in the abdominal area, so an unhealthy and excessive diet is a driving factor for central obesity. Central obesity is one of the main components of metabolic syndrome and has a high prevalence in the elderly group. Some studies show that more than half of the elderly population meets the criteria for metabolic syndrome, with abdominal obesity being the most dominant component. Pathophysiologically, obesity, especially visceral obesity, plays an important role in the occurrence of metabolic

syndrome. The accumulation of visceral fat leads to an increase in free fatty acids that trigger insulin resistance, disorders of lipid metabolism, as well as the activation of the sympathetic nervous system and renin–angiotensin, which contributes to hypertension and dyslipidemia. In the elderly, the impact of central obesity becomes more significant due to age-related physiological changes, such as decreased muscle mass, changes in fat distribution towards the abdomen, and decreased insulin sensitivity. This condition causes central obesity in the elderly to have greater metabolic effects than younger age groups (Silva, 2019). Swarup et al. (2025)

Another factor that is a strong driver of the occurrence of metabolic syndrome is hypertension, which in this study it is known that unhealthy and excessive diet has a significant relationship with the occurrence of hypertension in the elderly. Individuals with overeating behaviors have a five-fold higher likelihood of developing hypertension compared to individuals who have an adequate diet. These results are consistent with the theory of Renin-Angiotensin System Activation (RAS) stated by , which states that a diet high in saturated fats and salts can overactivate the RAS system, thereby increasing the production of angiotensin II, which narrows blood vessels and raises blood pressure. A diet characterized by excessive consumption of saturated fats and salt is the main trigger for overactivation of RAS, so a good diet is key in overcoming hypertension as a driving factor for the occurrence of metabolic syndrome in the elderly (Fahed et al. 2022; Silva *et al.* , 2019).

The relationship between diet and hyperglycemia in this study did not show a significant relationship. Even if an indication is found based on the risk of hyperglycemia, it can be stated that elderly individuals who have excessive eating behavior only have a higher probability of experiencing hyperglycemia one times higher when compared to individuals with adequate dietary behavior, the results are not significant. This happened because in the sample of this study who experienced hyperglycemic symptoms in respondents who had overeating skills, only 3 people out of 35 samples or as much as 8.6%. These results are corroborated by the theoretical statement of Fahed *et al.* (2022) and Swarup *et al.* (2025) which states that hyperglycemia is multifactorial, which means that it is not only influenced by diet, but also genetic factors, physical activity, central obesity, hormonal function (insulin resistance). So this can be analogous to the behavior of respondents who have unhealthy eating habits, but their glucose metabolism is still good or physically active, so it does not show hyperglycemia.

The same results were shown by the relationship between overeating behavior and the incidence of dyslipidemia, which based on the tests conducted there was no significant relationship between these two factors. Even if a test is carried out to estimate the risk of dyslipidemia, the elderly who have an overeating diet have a 0.8 times higher risk of dyslipidemia than individuals who have adequate eating behaviors, which shows that there is no significant difference in the results of these two behaviors on the incidence or symptoms of dyslipidemia. This may be because dyslipidemia is also strongly influenced by central obesity, physical activity, genetic status, and hormonal balance factors that are not described in this study (Fahed *et al.*, 2022; Swarup *et al.*, 2025).

Diet in Islamic Review: The 3J Concept (Amount, Type, Schedule)

Total Food

In the context of nutrition, the amount of food is related to the amount of intake that a person consumes according to the body's needs, both in terms of portions and nutritional content. The ideal diet according to Islamic teachings and modern health science is achieved through regular consumption of food, including carbohydrates, proteins, vegetables, and fruits in balanced portions. This principle is in line with the view that a balanced diet is the key to maintaining physical and spiritual health. Thus, Islamic teachings through the prohibition of *israf* emphasize the balance between bodily needs and self-control, as a form of gratitude and responsibility of a Muslim for the bodily mandate given by Allah SWT. (Irfan et al., 2023; Kurniasari, Wijaya and Rahman, 2023).

Types of Food

In the context of today's public consumption patterns, it also highlights the rampant consumption of fast food (Swastika et al. (2023) *junk food*) such as ready-to-eat fried chicken, spicy noodles, and sugary drinks. Although these foods are halal, the nutritional content tends to be high in saturated fats, simple carbohydrates, sugar, and sodium, which if consumed in excess can increase the risk of metabolic diseases such as high cholesterol, hypertension, and diabetes. The study also explained that various types of *fast food* have high energy content and nutrients that can trigger health problems if consumed continuously.

In addition to the prohibition of harmful foods, the Qur'an and the Sunnah of the Prophet PBUH provide examples of *thayyib* foods that are beneficial for health, including:

Dates

Dates are one of the foods that are highly recommended in Islam and are part of the sunnah of the Prophet Muhammad SAW. The Prophet PBUH said:

"Whoever consumes seven 'ajwah dates in the morning, on that day he will not be exposed to poison or magic." (HR. Bukhari and Muslim).

Dates contain natural carbohydrates, fiber, minerals, and antioxidants that are useful in maintaining metabolism and reducing oxidative stress (Irfan et al. , 2023; Nawawi, Afsa and Sa'diyah, 2024).

Honey

Honey in QS. An-Nahl 68-69 is described as the *syifa'* of mankind. Research shows that honey is rich in flavonoids, phenolics, vitamins, and enzymes that have antioxidant, anti-inflammatory, and immune effects. Honey consumption has been shown to help improve insulin resistance and lipid profile, making it relevant in the prevention of metabolic syndrome. Khairunnisa et al. (2023)

Milk

Milk is referred to as a healthy pure liquid in QS. An-Nahl: 66. explains that milk contains quality protein, calcium, and essential vitamins that are essential for energy metabolism, bones, and glucose balance. The Prophet PBUH also advocated the consumption of milk as part of preventive treatment (Asyafa et al. 2024).

Olive Oil

Olive oil is referred to as a food from the "blessed tree", it contains monounsaturated fatty acids and polyphenols that are able to lower LDL, increase HDL, and reduce the risk of cardiometabolic disease. This is in line with the recommendation of the Prophet PBUH to consume and use olive oil.

The concept of *thayyib* is not only related to the halalness of food, but also includes nutritional quality, food safety, and its benefits for health. This principle is reflected in the consumption patterns of Japanese people, which emphasize the use of natural ingredients, minimal processing, and balanced portions. This diet has been shown to contribute to a low risk of metabolic disease and a high life expectancy (Natsir, 2025).

Examples of *thayyib* foods that are commonly consumed in Japan include fish and fresh seafood as a source of protein and omega-3 fatty acids, which play a role in improving lipid profiles and lowering the risk of cardiometabolic disease. In addition, the consumption of rice in moderate portions, vegetables, seaweed, as well as traditional fermented foods such as miso and natto reflects the principle of balance (*wasatiyyah*) and supports metabolic health through the intake of fiber and probiotics (Natsir, 2025).

Thus, the consumption practices of Japanese society show that the value of *thayyib* is universal and can be applied across cultures, in line with Islamic teachings that emphasize the selection of nutritious, balanced, and non-excessive foods as an effort to maintain health and prevent metabolic syndrome, especially in the elderly.

Meal Schedule

Eating patterns and schedules in Islam emphasize simplicity, order, and self-awareness. The Prophet Muhammad PBUH became a perfect example in maintaining a balance between physical and spiritual health through meal timing, proportional portions, and adequate rest. This pattern is in line with modern health principles and can be applied as a guideline in maintaining the body's metabolism and preventing metabolic diseases in the elderly.

Eating Manners Recommended by the Prophet Muhammad PBUH

The Prophet Muhammad PBUH provided an example of eating manners that reflect spiritual, social, and health values. In a hadith from Ibn Abbas, the Prophet PBUH said:

"O young man, call upon the name of Allah (recite basmalah), eat with your right hand, and eat from the one closest to you." (HR. Bukhari and Muslim).

This hadith emphasizes the three main principles of eating manners in Islam, namely starting by saying the name of Allah as a form of dhikr and gratitude, using the right hand as ethics and cleanliness, and eating from the nearest part to cultivate a polite attitude and avoid greed. The scholars also explain that "eating from the closest" means being grateful for what is available, not wanting something much more luxurious or excessive when there is enough sustenance before us. This attitude fosters qana'ah and prevents greed, for example, when only simple food is available, but the heart still wants more luxury. In addition, the Prophet PBUH recommended that eating should be done calmly, not in a hurry, and stop before being full, as he said:

"It is enough for the son of Adam a few mouthfuls of food to uphold his bones; If you have to eat more, then one-third is for food, one-third is for drink, and one-third is for air." (HR. Tirmidhi).

From a health perspective, this eating habit has been proven to be beneficial because it helps the digestive process, controls calorie intake, and prevents metabolic disorders. Meanwhile, from the spiritual side, reading prayers before and after meals fosters gratitude, inner peace, and awareness that food is a blessing from Allah SWT (Irfan *et al.* 2023; Kurniasari, Wijaya and Rahman, 2023).

Thus, the eating manners exemplified by the Prophet Muhammad PBUH are not just religious ethics, but also a holistic healthy living guideline, maintaining a balance between the physical, mental, and spiritual health of Muslims.

Health and Metabolic Syndrome in the Elderly in an Islamic Review

The teachings of simplicity in Islam help maintain physical and mental balance. Meal portion management and selection of nutritious foods support weight stability, blood pressure, and metabolic function. From the spiritual side, this fosters gratitude and awareness that the body is a mandate that will be accounted for (Gusmita, Rukaiyah and Walad, 2024) .

Thus, maintaining health in the elderly is part of the experience of faith values. A balanced diet, choosing halal thayyiban foods and avoiding excessive consumption patterns are important steps in preventing metabolic diseases in the elderly group.

The Relationship of Diet with Metabolic Syndrome in the Elderly in an Islamic Review

The balanced diet taught by Islam is also in line with the principles of public health, namely controlling saturated fat intake, increasing fiber, and maintaining regularity at mealtimes. This pattern was shown to lower the risk of central obesity and hypertension, the two main components of metabolic syndrome found in the study.

The application of a moderate diet in Islam has been exemplified by the Prophet PBUH. Despite his age, he remained strong in leading the community and even led the troops in the events of the Tabuk War at the age of about 60, one of the proofs that his simple lifestyle and regular diet contributed to his physical health. This example shows how eating control can help

maintain fitness into old age (Basri et al., 2023). There is a hadith from Abu Hurairah (may Allah be pleased with him), the Prophet PBUH said, "A strong believer is better and more loved by Allah than a weak believer. But every believer is good." (HR. Muslim No. 2664).

This hadith shows that physical strength has spiritual value, because a healthy and strong body allows a person to worship, work, and contribute to society optimally. This power is not merely a worldly goal, but a means to carry out life's mandate better.

This value is also reflected in the example of the Prophet's companions, one of which is Abu Ayyub al-Anshari r.a. In Islamic history, Abu Ayyub continued to participate in jihad in the expedition to conquer Constantinople even though he had reached about 80 years of age. This reflects that maintaining health and strength throughout life is a form of seriousness in carrying out religious commandments, as well as proof that old age is not synonymous with helplessness if the body is well maintained from a productive age (Handoko, 2018).

In addition to the physical aspect, according to Aufa, Firdaus and Fadilurrahman (2024) *maqāṣid al-syarī'ah*, namely *hifz al-nafs* (nourishing the soul), because food is not only judged by its nutritional content, but also by its impact on spirituality, the environment, and a person's ability to carry out worship. Overeating is considered a form of waste of resources and goes against the principles of sustainability.

Thus, Islamic teachings view health not solely as the result of a healthy lifestyle, but also as the fruit of spiritual obedience and awareness. A halal, thayyib, and moderate *diet* not only prevents metabolic syndrome, but also maintains harmony between body, soul, and environment. This is in line with the values of the Qur'an which leads humans to maintain a balance in life so that they remain strong in worship, productive in society, and ready to face the phases of life until old age with full blessings.

CONCLUSION

The study found a relatively high prevalence of metabolic syndrome among elderly residents at the Hajjah Hasmah Noor Foundation Nursing Home in North Jakarta (54.3%, or 19 of 35 respondents), with major contributing factors including central obesity (60%), hypertension (65.7%), and dyslipidemia (54%), while hyperglycemia was less common (8.6%). Overeating showed a strong and significant association with metabolic syndrome, increasing the risk sixfold, although this relationship was only evident for central obesity and hypertension, not for hyperglycemia or dyslipidemia. These findings align with Islamic principles emphasizing moderation (*wasatiyyah*), avoidance of excess (*isrāf*), and the consumption of halal and thayyib foods, reinforcing the importance of balanced dietary practices as a preventive approach. Future research should explore larger and more diverse elderly populations and examine additional lifestyle factors—such as physical activity and long-term dietary patterns—to better understand their combined impact on metabolic syndrome and strengthen culturally relevant prevention strategies.

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